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ABSTRACT

The purpose of this handbook is to help educators in Oregon to provide a quality program in industrial arts for middle school students. The suggestions in this guide may help middle school industrial arts teachers plan activities to develop their students' awareness of technology in our culture and the variety of related careers available to them. The guide is organized in four sections. In the first section, an overview of the program is given, along with background information on industrial arts and the specific needs of middle school students. The second section of the guide describes the middle school curriculum, including goals and content. In the third section, sample outlines for courses are presented for teacher use in developing courses. An interdisciplinary approach is taken in this section. For each course, characteristics of students, student needs, program suggestions, and "thought starters" are given. The final section lists resources such as curriculum guides, information on special needs students, individual course topics, publishers' addresses, journals, and a bibliography that may be of use to educators planning middle school industrial arts programs. (KC)

middle school
INDUSTRIAL ARTS
a guide for teachers

Fall 1983

Verne A. Duncan
State Superintendent of Public Instruction

Oregon Department of Education
700 Pringle Parkway SE
Salem, Oregon 97310

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FOREWORD

Today's middle school students will live in a society that demands an understanding of advanced technology. As we move toward the next century, technical literacy will become increasingly important to all citizens. No longer is technology the sole domain of engineers and scientists, but of all who seek more effective ways to live their lives.

The suggestions in this guide will help middle school industrial arts teachers plan activities to develop their students' awareness of technology in our culture and the variety of related careers available to them. As students study the processes and tools of industry and technology, they begin to discover their own interests and talents, often laying the groundwork for future occupations.

This guide was created to help middle school teachers in Oregon encourage their students to understand technology and the vital role it will play in their futures and in the future of our nation.

Verne A. Duncan
State Superintendent of
Public Instruction

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PURPOSE

The purpose of this handbook is to help educators provide a quality program in industrial arts for middle school students.

GOAL BASED PLANNING

The handbook suggests ways teachers may organize an industrial arts curriculum consistent with Oregon's goal-based planning for K-12 instruction.

- **STATE GOALS** answer the question: What does the Department of Education think a student should get out of public schooling in Oregon?

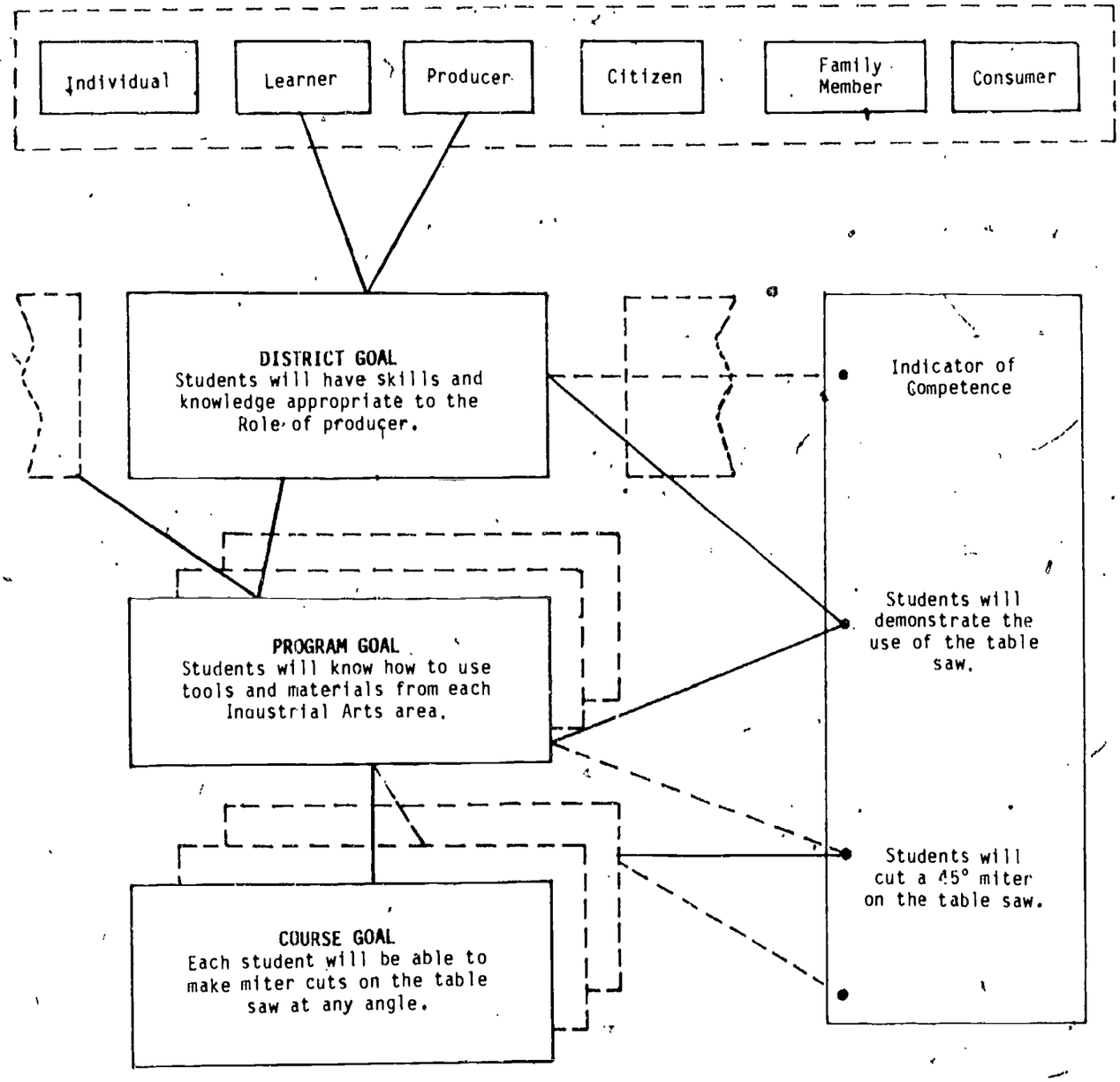
- **DISTRICT GOALS** answer the question: What do the local community and its schools think a student ought to get out of local schooling and how is that related to state goals?

- **PROGRAM GOALS** answer the question: What do the local curriculum planners and industrial arts teachers think a student ought to get out of industrial arts and how is that related to district goals?

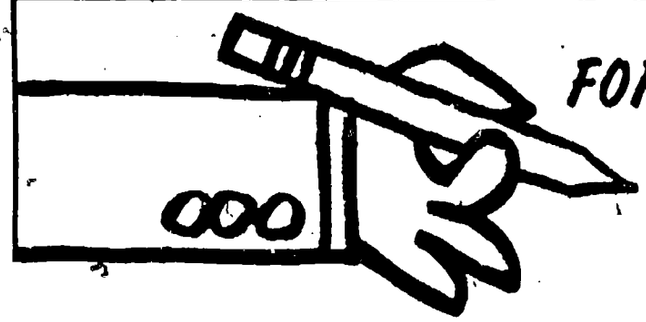
- **COURSE GOALS** answer the question: What do the industrial arts teachers think a student ought to get out of industrial arts courses and how does that relate to program goals?

- **COMPETENCY** means being capable and fit. For students, it means having demonstrated they can likely apply outside school what they've already learned - in or out of school.

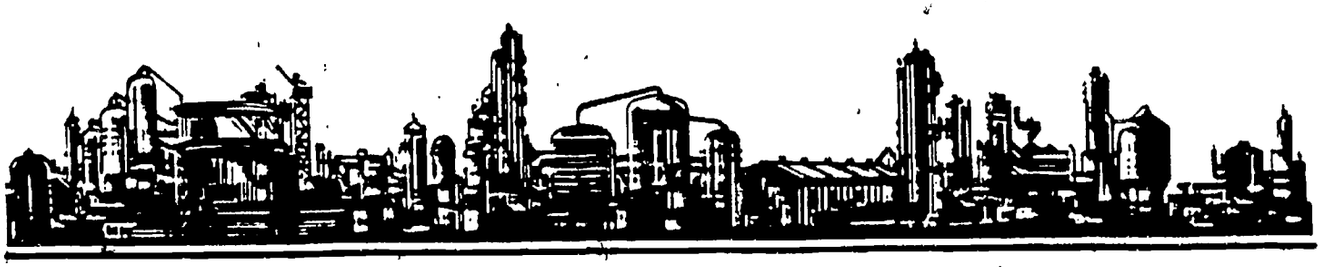
For example, in Industrial Arts



Goals are intended to help teachers, program specialists and administrators plan programs. Goals promote a framework for planning that can be shared by all those doing similar planning. Goals help in planning for individual student goals and interests, to be done within the limits of available resources. It is important that industrial arts teachers be directly involved in developing district, program and course goals so that the industrial arts instruction is coordinated with other program areas. Goals for industrial arts should not be used to limit what is planned; rather, they should be a starting point.



FOR YOUR NOTES

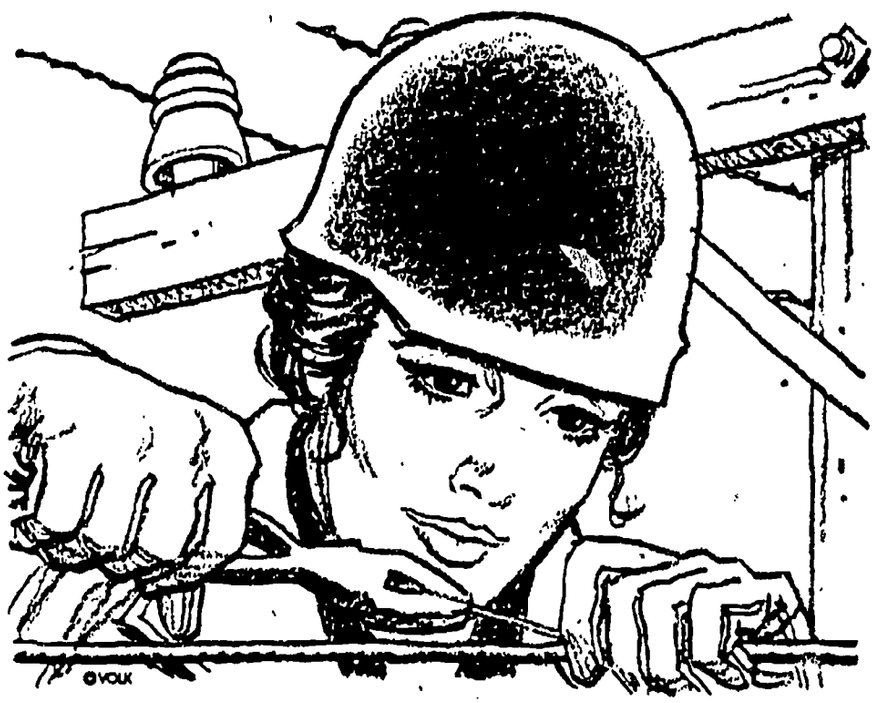


Since we cannot know all that is to be known of everything, we ought to know a little about everything.

Blaise Pascal

industrial arts

OVERVIEW



This section provides background information on industrial arts and the specific needs of middle school students.

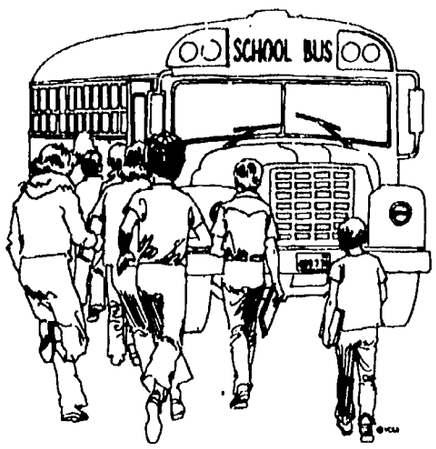
DEFINITION OF INDUSTRIAL ARTS

Industrial arts provides opportunities for students to develop an understanding of the many aspects of industry and technology: consumer, technical, occupational, managerial, social, historical and cultural. Furthermore, it helps students acquire industrial and technical knowledge and skills through creative and problem-solving concepts such as experimenting, planning, designing, constructing and evaluating. They also learn to use tools, machines and materials, and processes.

LIFE ROLES

All students will have the opportunity to develop the knowledge, skills, and attitudes necessary to function as:

- LEARNERS
- CITIZENS
- PRODUCERS
- CONSUMERS
- FAMILY MEMBERS

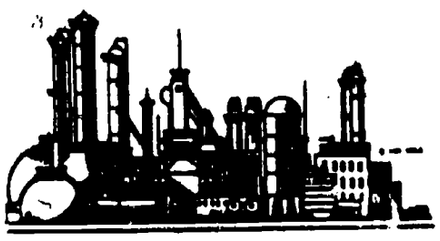


These life roles are statewide goals for "schooling" not for education. Education is thought to be the result of schooling, as well as of family and community experiences.

GOALS FOR INDUSTRIAL ARTS*

Each student will be able to:

- develop insights of industry and technology and their impact on our culture.
- discover and develop talents, attitudes and interests related to industrial or technical areas.
- develop abilities in the proper use of tools, machines and processes.
- develop problem-solving skills using the materials and products of industry.
- apply the content of industrial arts to other school subjects in the curriculum.
- develop an understanding of a variety of careers and their requirements.
- acquire knowledge and develop skills to manage personal resources.
- perform work in a manner safe to themselves and others.



**Adapted from "Guidelines for Industrial Arts in Career Education."*

EQUALITY

Industrial arts programs should be designed and operated to provide equal educational opportunities for all students, thereby complying with the following federal laws:

Title IX of the Education Amendments of 1972

- No person in the United States shall, on the basis of sex, be excluded from participation in, be denied benefits of, or be subject to discrimination under any education program or activity that receives federal assistance.

Title VI of the Civil Rights Act of 1964

- No person shall be discriminated against because of his or her race, color, or national origin in any program or activity that receives federal financial assistance.

Public Law 94-142, "Education for all Handicapped Children Act," mandates that free and appropriate public education be made available to all handicapped children and young adults in public schools until age 21.

- Procedures to assure that, to the maximum extent appropriate, handicapped children will be educated with children who are not handicapped, and that special classes, separate schooling, or other removal of handicapped children from the regular educational environment occurs only when the nature or severity of the handicap is such that education in regular classes cannot be achieved satisfactorily.

FOR MORE INFORMATION

Contact the Oregon Department of Education regarding guidelines and standards that have been developed to comply with federal mandates. Phone 378-2129.

CHARACTERISTICS OF MIDDLE SCHOOL STUDENTS

Middle schools care for the unique and specific needs of children between late childhood and adolescence, ages ten through fourteen. It is generally during these ages that children undergo the most distinct and dramatic changes in their intellectual, emotional, social and physical growth. Therefore, the programs and facilities provided for them must be different from those designed for elementary or for high school students.

-Students in middle school generally:

INTELLECTUAL

- show increased intellectual powers, ability to think abstractly, heightened curiosity.
- have limited attention span and may be easily distracted.
- show capacity for independent and critical thinking; can handle logical and inductive problem-solving tasks.
- shift from blind acceptance to testing and personalizing of values; use group processes to establish own self-worth.
- need basic communication skills; begin to demonstrate average adult abilities in reading, speaking and writing.

EMOTIONAL

- experience turbulent, shifting and sometimes conflicting emotions.
- tend to lack self-confidence; often appear moody and introspective.

E M O T I O N A L (CONT'D)

- are influenced by peers' opinions and behavior.
- often respond unpredictably to adult affection; may show rejection or ambivalence.
- experience accelerated hormonal changes and rapid physical growth that can produce erratic behavior patterns.
- question personal feelings, attitudes and values previously developed in home and primary grades.
- begin to explore moral and ethical questions such as reality, truth and goodness; can become fiercely idealistic.
- establish clearly-defined sex roles.

S O C I A L

- are influenced by peer group in developing social consci ice.
- are less influenced by parents for social behavior; becoming skeptical of adult opinions and behavior.
- want to make own decisions; seek personal autonomy and independence but are constrained by dependence on family and society.
- have greater personal and social sophistication; exposed to more and varied stimuli, e.g. TV, movies, newspapers.
- enjoy team sports activities.
- display hero worship involving members of same or opposite sex; feel self-conscious and anxious about their own behavior in relation to peer group.
- have initial confrontation with moral and ethical choices involving sexual experimentation, use of cigarettes, alcohol and drugs.

S O C I A L (CONT'D)

- experience fear and anxiety as result of moving from secure elementary school environment to larger concentrations of own ag group.

P H Y S I C A L

- experience restlessness and wide swings in energy levels.
- vary widely in physical size with rapid changes in body proportions.
- display poor physical coordination; rapid large muscle development taking place.
- become self-conscious about development of secondary sex characteristics.

Adapted from Middle School Standards, Portland Public Schools, November 1979.

GUIDANCE IN THE MIDDLE SCHOOL

Guidance and counseling services shall be available in the middle school and shall provide assistance by:

- orienting new students to the school and providing a bridge to high school.
- focusing the attention of all school personnel on student needs.
- drawing on school and community resources to assist with the physical, social and emotional problems of children.
- interpreting to the student and parents the cumulative record.
- interpreting pupil data to teacher.
- working with staff to develop appropriate guidance activities.

MULTI-CULTURAL/ETHNIC AWARENESS IN THE MIDDLE SCHOOL

All students should be encouraged to develop an understanding of and a respect for individuality and cultural/ethnic pluralism. Multi-cultural/ethnic concepts and philosophy shall be infused throughout the educational program and not limited to "multi-cultural activities" or to the social studies program.

Instructional programs should respond to the following goals:

- Awareness and appreciation of different cultures and ethnic groups.
- Development and encouragement of respect for cultural and ethnic pride.
- Recognition and reduction of the effects of cultural and ethnic stereotyping.

MULTI-CULTURAL/ETHNIC GOALS

Students will demonstrate an awareness of other cultures that enhances the activities of the industrial education program.

- **Students will be able to:**
- identify and explain how cultural and ethnic groups and individuals have contributed to methods of manufacturing and production.
- identify and demonstrate appreciation for the contributions of their own and other cultural and ethnic groups.
- identify the industrial and scientific accomplishments of various cultural and ethnic groups.
- understand and appreciate techniques from various cultural and ethnic groups that demonstrate construction methods.
- recognize and describe how various cultural and ethnic groups have used their natural resources.

BASIC ACADEMIC SKILLS

A purpose of the middle school instructional program is to provide instruction in basic reading, spelling, writing, grammar and computing.

Industrial arts programs, combined with basic academic skills instruction, encourage the development of all these skills. The combination of industrial arts concepts and basic skills instruction equip students to progress in mastering industrial arts concepts. Industrial arts provides a reason for learning basic academic skills. It lets the student know that these skills are important in life and in achieving career goals.

Adapted from Middle School Standards, Portland Public Schools, November, 1979.

BASIC ACADEMIC SKILLS GOAL

Students will know and use communication and mathematical skills related to the industrial education program.

Skill Areas	Students Will Be Able To:
A. Reading	
1. basic	use the basic skills of word identification and comprehension to read industrial education materials.
2. symbols	interpret necessary and appropriate symbols.
3. plans/drawings	interpret sketches, diagrams, charts, schematics and blueprints at the appropriate level.
4. technical manuals	read appropriate technical manuals.
B. Writing	
1. basic	use basic writing skills.
2. lettering	use appropriate lettering skills.
3. symbols	know the importance of clarity in industrial communication and use appropriate symbols.
4. plans/drawings	produce appropriate sketches, diagrams, charts, schematics and blueprints.
C. Listening/Observation	comprehend concepts and processes using basic listening and observation skills.
D. Speaking	verbally express the concepts and processes of industrial arts.

Skill Areas	Students Will Be Able To:
E. Measuring	
1. basic	use appropriate measurement skills accurately, including linear, areas and angles in both metric and English.
2. devices	use appropriate measurement devices accurately.
3. specialized	know and use specialized systems (e.g., pica, ohm, board foot, etc.)
F. Computation	perform necessary computation in whole numbers, fractions, decimals, percent and ratios.
G. Estimating	make realistic estimates of necessary materials and costs.

INTERDISCIPLINARY TEACHING

An excellent way to correlate industrial arts with other subjects is to establish a school-wide instructional theme. Different aspects of social issues such as transportation needs, resources, energy, environment and lifestyles can be examined through each area of instruction. No matter what the theme, however, industrial arts is an important part of the plan because it provides a practical application of the knowledge students gain in other areas.

A SAMPLE THEME

The mass production of a product requires the application of skills and knowledge developed in many subject areas. Students can gain practical experience by forming a classroom corporation with officers, creating a company name, trademark and products.

As product designs are developed, children apply the language, disciplines and processes of art. They apply the principles of shape, form, balance, color and texture in the development of their product designs. They meet as a group to evaluate individual designs. Here, as before, social studies concepts are applied to the selection of the design that will be used for the product. Basic concepts dealing with decision making, choice and citizenship are applied at this stage.

The class makes decisions about personnel, materials and equipment. Cooperation, decision making, and conflict resolution play a vital role in preparing for production. Problem solving, measurement and estimation are among the mathematical concepts used to determine materials and their costs, sale prices and profits, and number of products to be made.

The concepts of measurement are used extensively when children lay out and cut pieces of wood for the assembly line. The set-up and operation of an assembly line requires extensive use of problem-solving concepts. Children also apply estimation skills to determine the output of their assembly line.

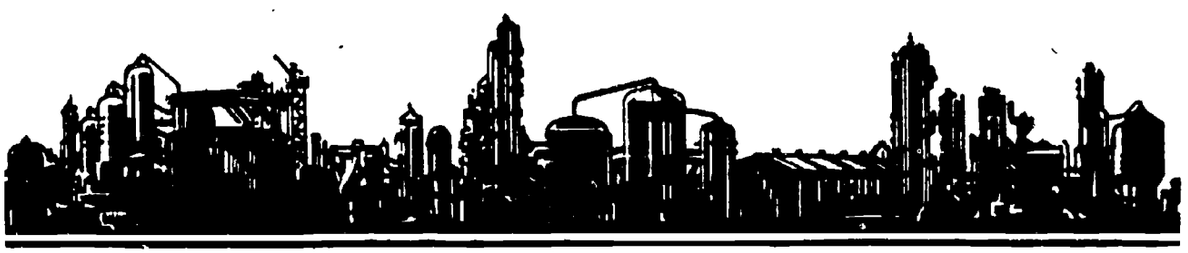
Production, packaging, and distribution of a product also utilize many scientific processes and principles. Mass production activities require the classification of natural and man-made materials. This activity also enables children to predict the quality and quantity of products emerging from their assembly line. In addition, children also have the opportunity to measure the performance of their assembly line, interpret the information and formulate alternate methods.

A production activity also provides children with the opportunity to apply the principles of simple machines, such as the wedge, level, pulley and screw. Children apply the basic principle of the lever when they use pliers, paper cutters and wrenches. The principle of the pulley is applied to an assembly line when parts are moved from one location to another with the aid of a moving belt. Children learn mechanical advantage by fastening parts together with screws and bolts.

There are numerous occasions when the motivation of using tools, materials and processes to produce a product can add interest to the reading program. Activities such as making simple jigs and fixtures, constructing an assembly line and shaping parts to specification give students a real and immediate reason for learning to read. The efficient and effective operation of a classroom production corporation requires good written and verbal communication. As children prepare stock certificates, sell stock, design products, order materials, write work orders and advertising, and assemble parts, they apply the skills, knowledge and disciplines of the language arts.

Production activities also provide first-hand opportunities for children to understand the need for safe work habits. Through these experiences, children develop attitudes regarding the health and safety of others.

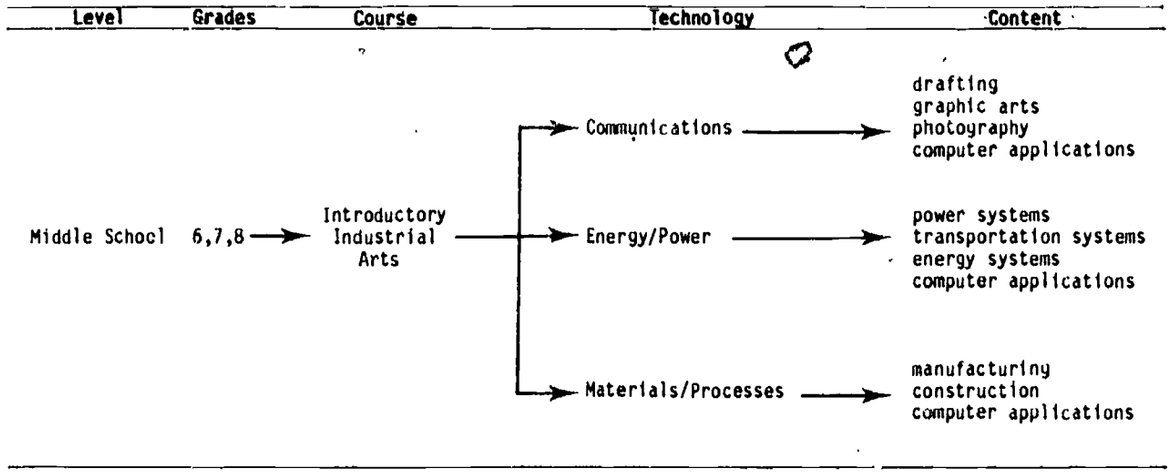
Mass production activities also stimulate an awareness of careers. They also enable children to cultivate an understanding that people are involved in or affected by work. Assemblers, boiler-makers, checkers, engineers, machinists and welders are among the many workers studied as children mass produce a product. In this manner, children become familiar with occupational classifications and potential areas of employment.

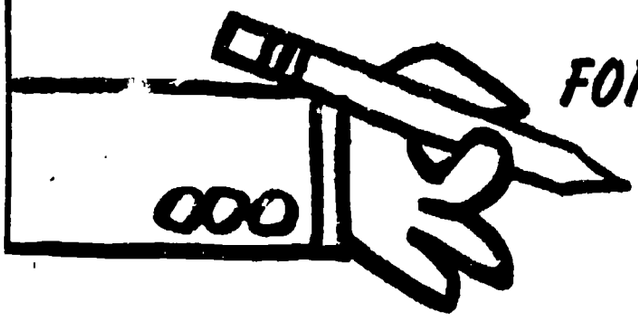


SCOPE & SEQUENCE	FOCUS
ELEMENTARY SCHOOL	Learning Reinforcement and Awareness
MIDDLE SCHOOL	Exploration
HIGH SCHOOL	Pre-vocational

CONTENT AREAS	INSTRUCTIONAL EMPHASIS
Industrial Arts activities integrated within the elementary curriculum	Provide students with introductory activities related to society and technology
Graphic Communications Energy and Power Materials-Processes	Provide students with an opportunity to discover and develop individual talents, attitudes, interests and potential as related to society and technology.
Graphic Communications Energy and Power Materials-Processes	Provide students with a closer look at specific technologies. This level develops fundamental skills in the proper use of common tools, materials and processes.

INDUSTRIAL ARTS CURRICULUM





FOR YOUR NOTES

The carpenter is not the best/who
makes more chips than all the rest.

Arthur Guiterman

middle school

CURRICULUM

The industrial arts middle school program is exploratory and interdisciplinary in nature. It emphasizes self-discovery and development through practical application of basic academic skills.

GOALS

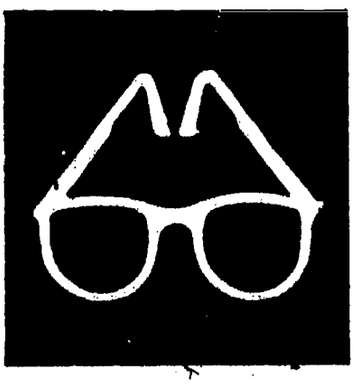
The middle school can create a learning environment that provides stability, promotes self-confidence, and is sensitive to the needs of each student. With that environment the school should provide opportunities for students to:

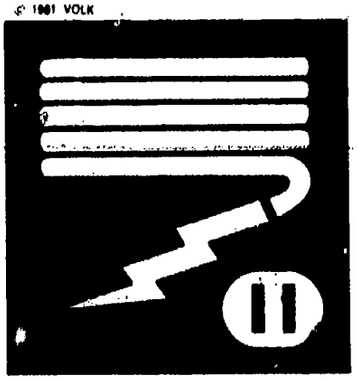
- explore wide variety of industrial and technological occupations.
- understand themselves and their relationship with others.
- become familiar with ways that technology is used to solve industrial problems.
- reinforce basic skills and use them to solve problems in all disciplines.
- develop safe work habits when using industrial tools, machines and materials in all areas of life.
- improve problem-solving and creative abilities.
- become proficient in the use of tools, machines, techniques and processes.
- identify and explore their interests and abilities through contact with a variety of industrial and technological activities.

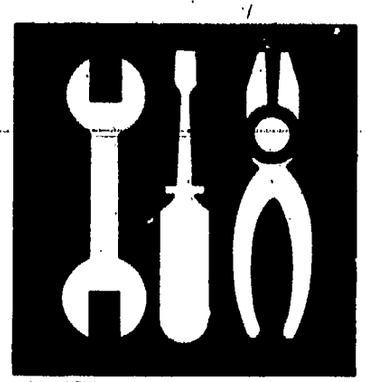
CONTENT

To accomplish its purpose, the middle school program should provide students with experiences in the following areas:

- **GRAPHIC COMMUNICATIONS**
- **ENERGY AND POWER**
- **MATERIALS-PROCESSES**







GRAPHIC COMMUNICATIONS

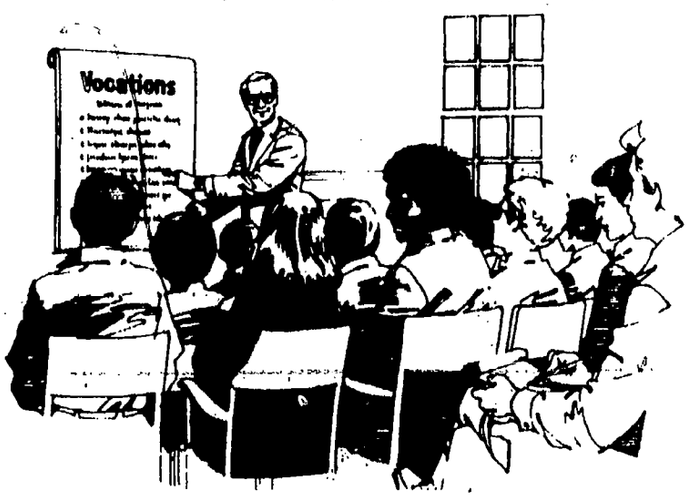
Graphic communications technology includes the study of drafting, graphic arts, photography and computer applications.

ENERGY AND POWER

Topics of study within this area include power systems transportation systems and energy systems. In power systems the student studies the generation, conversion, transmission, control and use of power. In transportation systems, the student examines the many aspects of moving people and materials. This includes exploration of movement in land, air, sea and space. Energy systems is a study of how people use and control energy to do work.

MATERIALS - PROCESSES

This area of study is designed to give students an overview of the materials and processes used by industry. Learning experiences address production processes, as well as how people organize and control themselves to produce and manage activities in manufacturing and construction.



Sample program and course goals along with suggested activities appear on the following pages.

PROGRAM GOAL

1. The student is aware of and understands the principles of graphic communications technology and its role in industry.

COURSE GOAL

1.1 The student knows how to design and present illustrative information.

SUGGESTED ACTIVITIES

1.1.1 Select and apply graphic symbols to convey a message.

1.1.2 Communicate ideas by making thumbnail, rough and finished sketches.

1.1.3 Use orthographic projection and drawings to convey ideas or messages.

COURSE GOAL

1.2 The student knows how to prepare materials for reproduction.

SUGGESTED ACTIVITIES

1.2.1 Set type to convey a message or idea.

1.2.2 Develop a message on a paper offset master.

1.2.3 Prepare a message on a mimeograph master.

COURSE GOAL

1.3 The student knows how to reproduce messages.

SUGGESTED ACTIVITIES

1.3.1 Select and apply graphic symbols to convey a message.

1.3.2 Use a spirit duplicator to reproduce a message.

COURSE GOAL

1.4 The student knows how to produce a photographic image.

SUGGESTED ACTIVITIES

1.4.1 Expose black and white film.

1.4.2 Process black and white film.

1.4.3 Make contact prints.

1.4.4 Produce black and white enlargements.

COURSE GOAL

1.5 The student possesses basic computer literacy.

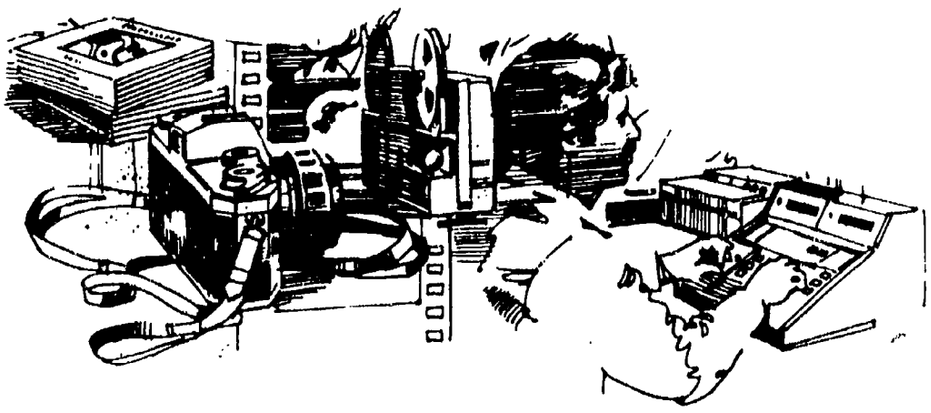
SUGGESTED ACTIVITIES

1.5.1 List basic functions of computers in industry and technology.

1.5.2 Enter data into a microcomputer.

1.5.3 Use a microcomputer to help solve laboratory problems.

1.5.4 Write a simple program for the microcomputer.



PROGRAM GOAL

2. The student is aware of and understands energy and power technology and their roles in industry.

COURSE GOAL

2.1 The student knows the basic kinds of energy and how each is converted from one form to another.

SUGGESTED ACTIVITIES

2.1.1 List major classifications of energy and the basic units in which each is measured.

2.1.2 Build a waterwheel to capture mechanical energy from moving water.

2.1.3 Build a wind generator to capture mechanical energy from the wind.

2.1.4 Build a solar collector.

2.1.5 Using a shop steam engine, convert energy from one form to another.

2.1.6 Convert electrical energy using a battery, a small motor, an incandescent lamp, a speaker and a resistor.

2.1.7 Construct simple electrical devices, such as a crystal receiver or two-transistor receiver.

2.1.8 Disassemble and then reassemble a two-stroke or four-stroke internal combustion engine.

2.1.9 Construct and launch a model rocket.

2.1.10 Construct and operate a rocket-powered model car.

2.1.11 Conduct studies on home energy consumption.

2.1.12 Conduct experiments with various insulating materials.

COURSE GOAL

2.2 The student knows how power is transmitted via mechanical, electrical and fluid transmission systems.

SUGGESTED ACTIVITIES

2.2.1 List characteristics of mechanical, electrical and fluid power transmission systems.

2.2.2 Identify basic components of mechanical, electrical and fluid power systems.

2.2.3 Use low voltage transformers to transmit electricity from one shop station to another.

2.2.4 Assemble a simple fluid mechanical assembly that will automatically control motion in a system.

COURSE GOAL

2.3 The student knows the characteristics of various transportation systems used to move people and materials.

SUGGESTED ACTIVITIES

2.3.1 Compare transportation systems to discover why they have been selected to perform certain functions.

2.3.2 Describe the consequences of using one system over another.

2.3.3 Conduct cost effectiveness studies of different transportation systems.

2.3.4 Build a model of the interstate highway system.

2.3.5 Build a model of this country's navigable waterways system.

PROGRAM GOAL

3. The student is aware of and understands the technology of materials-processes used in manufacturing and construction.

COURSE GOAL

3.1. The student knows the characteristics of manufacturing and construction corporations.

SUGGESTED ACTIVITIES

3.1.1 Identify characteristics of corporations.

3.1.2 Identify some advantages and disadvantages of corporations.

3.1.3 Name three corporations and identify their trademarks.

COURSE GOAL

3.2 The student knows the process of forming a corporation.

SUGGESTED ACTIVITIES

3.2.1 Form a corporation by electing three students to the board of incorporation, naming the corporation, selecting an agent, filling out forms to request a charter, and designing a trademark.

COURSE GOAL

3.3 The student knows the process of locating a plant and securing resources.

SUGGESTED ACTIVITIES

3.3.1 Name three specific examples from each of the following: natural resources, energy and human resources.

3.3.2 Secure capital to begin a corporation by issuing stock.

3.3.3 Maintain corporation records on a classroom computer.

COURSE GOAL

3.4 The student knows the relationship of people to the corporation.

SUGGESTED ACTIVITIES

3.4.1 Explain the role of stockholders, directors and a corporation president.

3.4.2 Complete an organization chart according to the names of students selected for each job.

COURSE GOAL

3.5 The student knows how to make a sales forecast.

SUGGESTED ACTIVITIES

3.5.1 Complete a consumer survey.

3.5.2 Complete a sales forecast.

3.5.3 Enter survey and sales forecast data into a classroom computer.

COURSE GOAL

3.6 The student knows the process for designing and engineering a product.

SUGGESTED ACTIVITIES

3.6.1 Make a 3-D model or mock-up of the product.

3.6.2 Make components for a prototype.

3.6.3 Assemble components to produce a prototype.

3.6.4 Enter design and engineering data into a microcomputer.

COURSE GOAL

3.7 The student knows production planning methods.

SUGGESTED ACTIVITIES

3.7.1 Complete a production flowchart.

3.7.2 Enter production data into a microcomputer.

COURSE GOAL

3.8 The student knows characteristics of robotics.

SUGGESTED ACTIVITIES

3.8.1 Identify characteristics of robots.

3.8.2 Identify some advantages and disadvantages of robots.

3.8.3 Name three industries which use robots.

COURSE GOAL

3.9 The student knows the methods of production and quality control.

SUGGESTED ACTIVITIES

3.9.1 Inspect components and distinguish between the reject and acceptable components.

3.9.2 Maintain production, construction and quality control records in a classroom computer.

COURSE GOAL

3.10 The student knows the process of making and combining components and subassemblies.

SUGGESTED ACTIVITIES

3.10.1 Combine manufactured and purchased components into a completed product.

3.10.2 Build appropriate components using wood, metal, plastics, ceramics or other materials.

3.10.3 Use a microcomputer to assist with manufacturing or construction.

COURSE GOAL

3.11 The student knows the process of distribution and sales of products.

SUGGESTED ACTIVITIES

3.11.1 Develop a package that will protect, identify, display and store a product.

3.11.2 Produce and insert into the package a service manual for the product.

COURSE GOAL

3.12 The student knows the process for liquidating a corporation.

SUGGESTED ACTIVITIES

3.12.1 Balance the corporation books and dissolve the corporation.

3.12.2 Calculate a final dividend for each stockholder.

PROGRAM GOAL

4. The student is aware of self and career opportunities in industry.

COURSE GOAL

4.1 The student knows his or her own interests, aptitudes and attitudes.

SUGGESTED ACTIVITIES

4.1.1 Use tools and materials that are representative of those used by persons working in industry.

4.1.2 Complete an interest inventory or aptitude test.

COURSE GOAL

4.2 The student knows educational and occupational requirements of industry-related jobs.

SUGGESTED ACTIVITIES

4.2.1 Interview a worker.

4.2.2 Observe a worker on the job.

4.2.3 Visit a high school, community college or other vocational training program.

COURSE GOAL

4.3 The student knows advantages and disadvantages of various industry-related occupations.

SUGGESTED ACTIVITIES

4.3.1 Interview a worker and determine opportunities for advancement in that job.

4.3.2 Use the help wanted section of the newspaper to determine the demand for workers in selected fields. Report the findings.

SAFETY

PROGRAM GOAL

5. The student knows the importance of working in a safe manner.

COURSE GOAL

5.1 The student knows and practices safety policies and procedures.

SUGGESTED ACTIVITIES

5.1.1 Form a student safety and health committee.

5.1.2 Have students develop a safety program.

5.1.3 Have students appoint a safety foreman.

5.1.4 Encourage students to enforce their safety program.

5.1.5 Have students perform weekly shop safety inspections.

COURSE GOAL

5.2 The student knows how to use tools safely.

SUGGESTED ACTIVITIES

5.2.1 Have students sharpen hand tools.

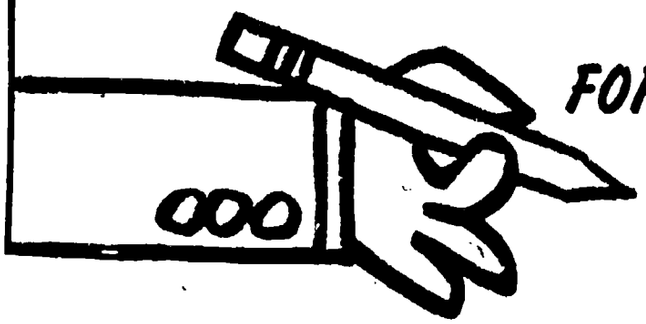
5.2.2 Have students perform routine machine tool maintenance.

COURSE GOAL

5.3 The student knows when and where to use protective clothing and devices.

SUGGESTED ACTIVITIES

5.3.1 Reinforce student compliance with rules through a safety awards program.



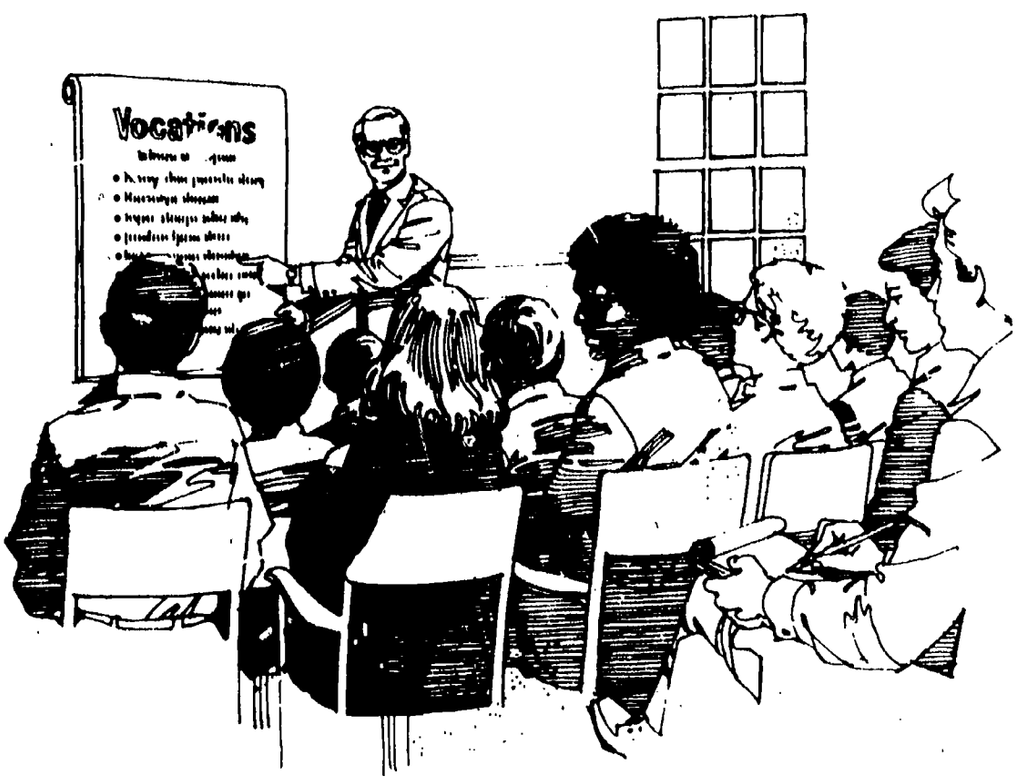
FOR YOUR NOTES

Education makes a people easy to lead, but difficult to drive; easy to govern; but impossible to enslave.

Henry Peter, Lord Brougham

course

OUTLINES



This section contains sample outlines from various sources. They are presented as examples for use in developing your own courses.

Knowledge is derived from action . . .
To know an object is to act upon it
and transform it . . .

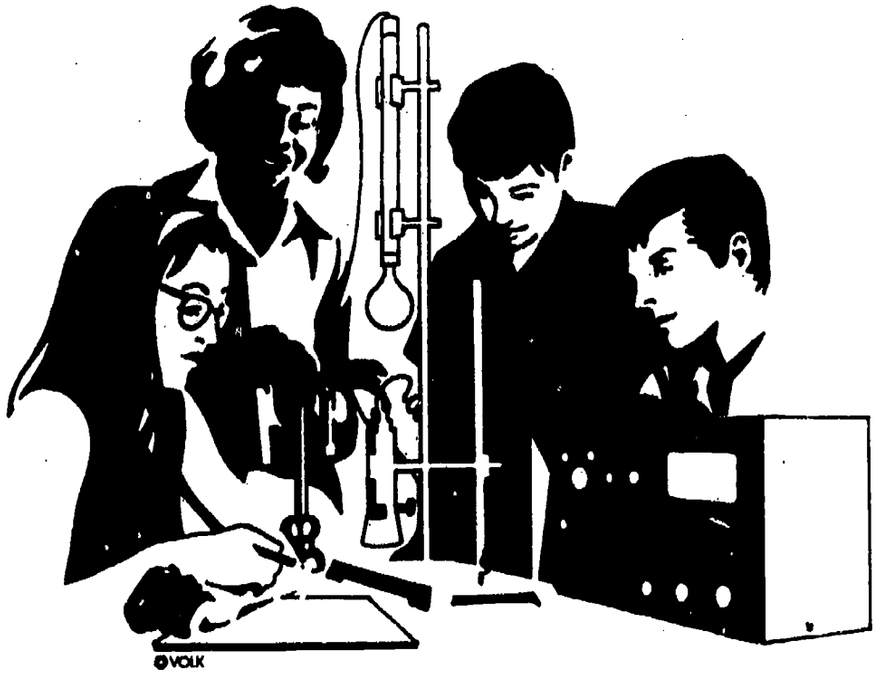
To know is therefore to assimilate reality
into structures of transformation and these
are the structures that intelligence
construes as a direct extension of our activities

Piaget

INTERDISCIPLINARY APPROACH

While the following outlines are organized according to industrial arts content, every effort should be made to correlate this content with other middle school subjects. Industrial arts is an important part of the entire curriculum and should be organized for interdisciplinary instruction.

An interdisciplinary approach requires teachers, counselors and administrators who know and understand the benefits as well as other problems that may be encountered during instruction. In order to maximize the benefits and minimize problems, the interdisciplinary program should be carefully planned and executed. Teachers should be given adequate preparation for the joint instructional effort. One of the best documents that describes how to organize faculty for interdisciplinary teaching is titled, "Career Exploration Industrial Arts, Occupational Versatility." It is referenced in the resource section of this handbook.



MIDDLE SCHOOL CURRICULUM CONSIDERATIONS

Characteristics of Students	Needs of Students
Physical	
- Easily fatigued - Poor motor coordination - Sexually maturing - Growth spurts	- Short activities - Non-competitive atmosphere - Low stress - Teacher acceptance of differences in coordination/maturation
Personal	
- Sensitive, anxious, uncertain - Need adult and peer approval - Inconsistent behavior - Easily discouraged	- Supportive staff - Staff and students must know each other, have consistent support base - Strong guidance effort by all staff - Structured
Intellectual	
- Slowing brain growth - High curiosity - Highly different stages of development - Need active involvement - Focus on immediate goals, needs and purposes - Need to discuss, share experiences with adults - See relationships among similar concepts - Begin to deal with the "possible" and abstract - Exhibit wide range of individual interests	- Firm basic skills in all areas - Varied activities - short in duration - Learning related to real world, students, other disciplines - Abstract concepts clarified with concrete examples - Provisions for individual skill and interest levels

Adapted with permission from an unpublished document by Jim Heywood, Eugene Public Schools 5/18/83.

MIDDLE SCHOOL CURRICULUM CONSIDERATIONS

Program Suggestions	"Thought Starters"
- Plan short units with varied pace - Allow for poor coordination - Reduce competition - Structure day with some low intensity (rest-low pressure) periods	- Physical education curriculum to focus on non-competitive, short, skill-building activities - Art--build fine motor skills
- Establish a supportive atmosphere--homebase, block guide type program - Group or provide for different skill levels - Have multi-age classes - Provide activities with a high success ratio	- Allow for informal interaction between adults and students - Organize so students spend more time with one teacher - Organize curriculum conceptually, not by grades - Continuous skill sequence - Grade on criterion "PR" basis
- Organize concepts and/or subject areas on an interdisciplinary basis - Define essential themes or concepts - Devise assessment--diagnose/prescribe/tracking system skill continuum - Guided, required exploration - Identify concrete abstract continuum for major concepts - Focus on kids--not the "structure of the discipline" - Stress career exploration	- Each department identify basic concepts/themes--pool across subjects - Make agreements regarding skill emphasis and common expectations - Debate ability grouping, individual skill tracking, etc. - Look at net grading/evaluation system--criterion referenced - Redevelop activities in classes to focus on concrete "lead ins," inter-relationships, skill focus, short term goals, curiosity provoking activities

COURSE OUTLINE

GRAPHIC COMMUNICATIONS (6 weeks)

I. Introduction to Drafting--4 weeks
   A. Pictorial dr ing
      1. Application
      2. Sketching
      3. Oblique
      4. Isometric

   B. Orthographic drawing
      1. Applications
      2. Planning
      3. Equipment
      4. Measuring Drawing to Scale
      5. Layout
      6. Multiview Drawing
      7. Two view
      8. Three view
      9. Practical applications of production technology

   C. Occupations in drafting
      1. Career study

II. Graphics--2 weeks
   A. Applications
   B. Design and layout
      1. Elements of design
      2. Development of product label design
   C. Photo process
      1. Simple camera--pinhole
      2. Film developing
   D. Printing processes
      1. Ditto
      2. Blueprint
      3. Multilith
      4. Silkscreen/stencil
   E. Occupations in graphics

ENERGY AND POWER (6 weeks)

I. Mechanical Power Systems--2 weeks
   A. Generation--internal combustion engine
      1. Two stroke
      2. Four stroke
      3. Diesel
      4. Turbines
   B. Conversion--combustion and fuels
   C. Transmission--6 simple machines
   D. Application--uses of each engine type
   E. Occupations
   F. Safety

II. Electrical Power System--2 weeks
   A. Generation
      1. Piezo electric
      2. Chemical
      3. Heat
      4. Light
      5. Friction
      6. Magnetic
      7. Bio
   B. Transmission--electrical
   C. Control and use--wiring and circuitry
   D. Safety
   E. Occupations

III. Alternative Energy Systems--2 weeks
   A. Sources
      1. Solar
      2. Wind
      3. Geothermal
   B. Conversion--heat, light, electricity
      1. Solar
      2. Wind
      3. Geothermal
   C. Storage
      1. Solar--rock box, trombe wall, battery
   D. Transmission
      1. Active
      2. Passive

MATERIALS-PROCESSES (6 weeks)

I. Industrial Organization--1 week
   A. Historical perspective
   B. Management
   C. Research and development
   D. Careers in production

II. Production Processes--4 weeks
   A. Industrial processes - (2 weeks)*
      1. Cutting
      2. Forming
      3. Fastening
      4. Finishing

*Materials introduced will be wood, plastic and metal.

COMMUNICATION INSTRUCTIONAL UNITS

I. Introduction to Communication Technology

- A. Communication systems
- B. Models of communication

II. Drafting Communication

- A. Equipment
- B. Techniques
- C. Types of mechanical drawing
- D. Drafting careers

III. Graphic Communication

- A. Image generation
- B. Basic principles of photography
- C. Binding, finishing and packaging
- D. Graphic communication careers

IV. Communication Enterprise

- A. Production
- B. Management
- C. Sales
- D. Advertising
- E. Personnel
- F. Financial
- G. Supplies and equipment

Adapted from Master Plan for Industrial Arts in New Mexico.

POWER AND ENERGY INSTRUCTIONAL UNITS

I. Energy and Power Sources

- A. History of power; terminology
- B. Common energy sources in use today
- C. Measurement of work and power

II. Natural Sources of Power

- A. Wind
- B. Water
- C. Solar
- D. Human
- E. Other
- F. Career opportunities

III. Transmission and Control of Power

- A. Mechanical
- B. Fluid power
- C. Electrical power
- D. Heat engines
  1. Internal combustion
  2. External combustion
  3. Career opportunities

IV. Applications of Power in Transportation Systems

- A. What is transported
- B. Where and how it is transported (land, sea, air, space)
- C. Need for transportation systems
- D. Career opportunities in transportation technology

Adapted from Master Plan for Industrial Arts in New Mexico.

INDUSTRIAL ARTS CRUISE

I. Development of Industry and Industrial Arts

- A. Industrial Revolution in England and the U. S.
- B. Division of labor
- C. Assembly lines
- D. Interchangeable parts
- E. Time and motion studies
- F. Labor unions
- G. Recent developments in industry
- H. Future of industry and technology
- I. History of industrial and vocational education
- J. Future trends in industrial arts

II. Government and Industry

- A. Free enterprise
- B. Competition vs. monopolies
- C. Public utilities
- D. Patents, copyrights, trademarks
- E. Gross national product
- F. Proprietorships
- G. Partnerships
- H. Corporations

III. Setting Up A Manufacturing Company

- A. Personnel Department
  1. Functions
  2. Job-hunting skills
  3. Interviews and resumes
  4. Types of jobs within personnel department
- B. Research and Development Department
  1. Functions
  2. Types of jobs within research and development department
- C. Production Department
  1. Functions
  2. Types of jobs within production department

D. Marketing Department
    1. Market research
    2. Advertising
    3. Sales
    4. Distribution
    5. Types of jobs within marketing department

IV. Types of Industry

A. Manufacturing
B. Construction
C. Power and Transportation
D. Communications
E. Occupation reports on any of the above areas

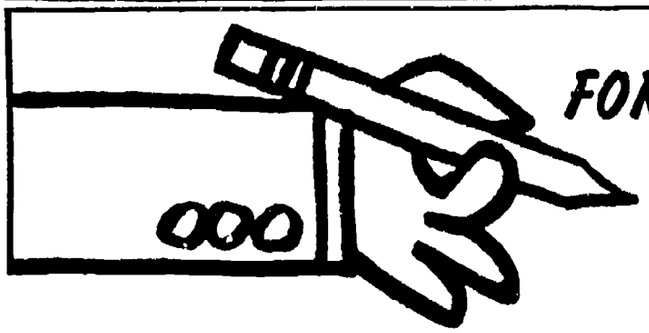
V. Industrial Machines, Materials and Processes

A. Materials used
B. Processes and plans
    1. Introduction to drafting
    2. Flow charts (plan of procedure)
    3. Plant layouts
    4. Materials list
C. Safety and worker attitudes
D. Individualized study of industrial tools and machines

VI. Production

VII. Study of High School and 8th Grade Industrial Arts Courses

Contributed by John Scheideman, Madras Junior High School.



FOR YOUR NOTES

Native ability without education
is like a tree without fruit

Aristippus

RESOURCES

Many resources are available to develop and present industrial arts experiences to middle school students. A few resources appear on the following pages.

CURRICULUM/INSTRUCTION

DeVore, P. Technology: An Introduction (Worcester, MA: Davis Publications, 1982)

Giachino, J.W. & Gallington, R. Course Construction in Industrial Arts, Vocational and Technical Education (4th ed.) (Alsip, IL: American Technical Publishers, 1978)

Miller, W.R. & Boyd, G. Teaching Elementary Industrial Arts (South Holland, IL: Goodheart-Wilcox, 1979)

The Oregon Department of Education, Career Exploration: Industrial Arts - Occupational Versatility. (Salem: the Department, 1975)

The Oregon Department of Education, Elementary - Secondary Guide for Oregon Schools: Part I (Salem: the Department, 1980)

The Oregon Department of Education, Safety in Oregon Schools (OAR 581-22-706) (Salem: the Department, 1981)

The Oregon-Washington Constortium, Industrial Arts Curriculum Planning Guide. (Salem: the Oregon Department of Education, 1979)

Pytlik, E., Lander, D. and Johnson, D. Technology, Change and Society (Worcester, MA: Davis Publications, 1982)

Silvius, H. and Bohn, R. Planning and Organizing Instruction (2nd Ed.) (Bloomington, IL: McKnight, 1976)

Silvius, H. and Curry, E. Managing Multiple Activities in Industrial Education (2nd Ed) (Bloomington, IL: McKnight, 1971)

SPECIAL NEEDS

Kimeldorf, M. Mainstreaming in Industrial Arts (Worchester, MA: Davis Publications, 1981)

Sarhees, M. and Scott, J. Vocational Special Needs (Alsip, IL: American Technical Publishers, 1981)

Wall, J. (ed) Vocational Education for Special Groups (Arlington, VA: American Vocational Association Special Publications, 1982)

BASIC SKILLS

Brown, W. Basic Mathematics (South Holland, IL: Goodheart-Wilcox, 1980)

Harp, W. Reading in Vocational Education (Salem, OR: Marion Education Service District, 1981)

Incardone, P. Teaching Students to Read Better (Arlington, VA: American Vocational Assocation Special Publications, 1982)

Johnson, B. Speaking and Listening in Vocational Education (Salem, OR: Marion Education Service District, 1983)

Mathematics for Careers Series (Albany, NY: Delmar Publishers, 1981)

Moore, M. Mathematics in Vocational Education (Salem, OR: Marion Education Service District, 1982)

Stamps, M. Writing in Vocational Education (Salem, OR: Marion Education Service District, 1983)

GRAPHIC COMMUNICATIONS

Broehhuizen, R. Graphic Communications (2nd ed) (Bloomington, IL: McKnight, 1979)

Brown, W. Drafting (South Holland, IL: Goodheart-Wilcox, 1982)

DuVall B. et al. Getting the Message: The Technology of Communication (Worcester, MA: Davis Publications, 1981)

Kagy, F. Graphic Arts (South Holland, IL: Goodheart-Wilcox, 1980)

Lathrop, I. and LaCour. The Basic Book of Photography (Alsip, IL: American Technical Publishers, 1979)

McCoy, R. Practical Photography (3rd ed) (Bloomington, IL: McKnight, 1972)

Miller, R. et al. Graphic Arts (Bloomington, IL: McKnight, 1978)

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ENERGY AND POWER

Atteberry, P. Power Mechanics (2nd ed) (South Holland, IL: Goodheart-Wilcox, 1978)

Bohn, R. and MacDonald, A., Power: Mechanics of Energy Control (Bloomington, IL: McKnight, 1970)

DeOld, A. et al. Transportaion: The Technology of Moving People and Products (Worcester, MA: Davis Publications, 1980)

Devore, P. ed. Introduction to Transportation (Worcester, MA: Davis Publications, 1980)

Duffy, V. Power: Prime Mover of Technology (2nd ed) (Bloomington, IL: McKnight, 1972)

Gerrish, H. Electricity (2nd ed) (South Holland, IL: Goodheart-Wilcox, 1978)

Miller, W. ed. Electricity (Bloomington, IL: McKnight, 1978)

Miller, W. ed. Power Mechanics (Bloomington, IL: McKnight, 1978)

Schwaller, A. Energy Technology (Worcester, MA: Davis Publications, 1980)

MATERIALS - PROCESSES

Bame, A. and Cummings, P. Exploring Technology (Worchester, MA: Davis Publications, 1980)

Betts, M, Fannin, J. and Havenstein, A. ed. Exploring the Construction Industry (Bloomington, IL: McKnight, 1976)

Fales, V. et al. Manufacturing (Bloomington, IL: McKnight, 1980)

Gerbracht, C. and Robinson, F. Understanding America's Industries (2nd ed) (Bloomington, IL: McKnight, 1971)

Heiner, C. and Hendrix, W. People Create Technology (Worcester, MA: Davis Publications, 1980)

Lux, D. et al. World of Construction (5th ed) (Bloomington, IL: McKnight, 1982)

MATERIALS - PROCESSES (Continued)

Lux, D. et al. World of Manufacturing (4th ed) (Bloomington, IL: McKnight, 1971)

Minton, B. and Minton, G. Elementary School Learning Package (Worcester, MA: Davis Publications, 1981)

Wright, T. and Jensen, T. Manufacturing (South Holland, IL: Goodheart-Wilcox, 1983)

OSU Clearinghouse for Computer Applications in Vocational Education

WHAT IS IT?

The OSU Clearinghouse for Computer Applications in Vocational Education provides a central clearinghouse for the co-ordination of microcomputer use in vocational education. The dramatic increase in the use of microcomputers both at work and in schools has created a special need for the use of microcomputers in vocational education programs. The Clearinghouse can help vocational teachers meet these needs.

WHAT SERVICES DOES IT OFFER?

Coordinate the review and evaluation of computer software with application in all areas of vocational education.

Disseminate educational software evaluations of computer programs with application in all areas of vocational education.

Disseminate public domain (non-copywritten) computer programs to vocational teachers.

Conduct workshops and seminars to prepare teachers in the use of computers and computer software in vocational education programs.

HOW CAN YOU PARTICIPATE?

If you currently use microcomputer software with application in any area of vocational education you can serve as a field evaluator for the Clearinghouse. Using the Clearinghouse Vocational Education Software Evaluation Instrument you can review software with application in vocational education.

If you are developing or adapting public domain programs with application in vocational education you can send them to the Clearinghouse and share them with other vocational teachers around the country.

You can order public domain programs from the Clearinghouse. The charge per 5 1/4" floppy disk is $5.00 plus $2.00 for postage and handling. The Clearinghouse now has over 50 public domain programs in many areas of vocational education.

You can arrange for us to conduct a workshop or seminar on the use of microcomputers in vocational education for your school or district.

FOR MORE INFORMATION CALL OR WRITE

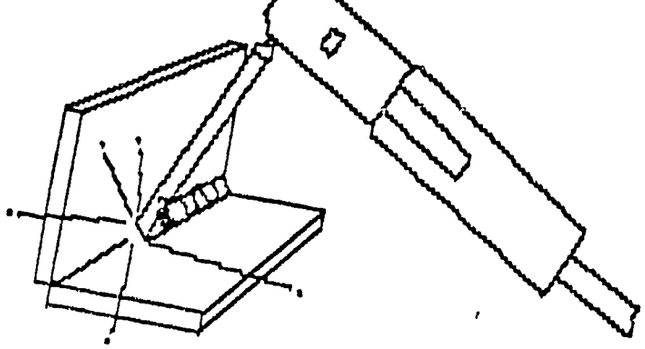
Sam Stern, Director
OSU Clearinghouse for Computer Applications
in Vocational Education
Department of Vocational & Technical Education
Oregon State University
Corvallis, OR 97331-2404
(503) 754-2733

OSU Clearinghouse for Computer Applications in Vocational Education

You can order any of the following disks from the Clearinghouse. All of the programs are written in Applesoft. Please enclose $5.00 per disk and $2.00 for postage and handling.

DISK 001

*A 005 HI
*A 024 MICROM
*B 010 MICROT
*A 009 SHEET METAL PROJECT COSTS
*A 023 COMMON MACHINE SHOP FORMULAS
*A 012 BUILDING HEAT LOSS
*A 036 ENERGY GRAPHS
*A 003 BOARD FEET
*A 017 CONSTRUCTION FRAMING ESTIMATIO
*A 008 ROOF FRAMING
*A 021 CIRCUIT REQUIREMENTS FOR HOME
*A 005 ANTENNA SPECS
*A 005 CAPACITIVE REACTANCE
*A 010 RESISTOR COLOR DECODING
*A 007 OHM'S LAW PROGRAM
*A 015 OHM'S/WATT'S LAW
*A 018 CAPACITANCE-RESISTANCE
*A 023 BASIC ELECTRICITY TEST
*I 015 ENGINE
*A 020 HORSEPOWER
*A 009 CYLINDER DISPLACEMENT
*A 006 LAND SPEED RECORD ASSAULT VEHI
*A 023 INDUSTRIAL ARTS INTRODUCTION
*A 010 FRACTION PRACTICE
*A 018 ABRASIVES
*A 004 FIGURING INTEREST
*A 006 LOAN AND INTEREST COST ANALYSI
*A 006 BREAK-EVEN POINT
*A 021 PROPERTIES OF A CIRCLE
*A 018 FILM DEVELOPER
*A 015 AIRFOIL
*A 025 APPLE GRAPHICS
*A 005 EGGCRAFT CARRIER
*A 008 TIME=MONEY
A 002 C
*B 022 INTEGER BASIC-DISK
A 012 MICROMETER



DISK 002

A 007 HELLO
A 051 TWO POINT PERSPECTIVE
A 014 DECIMAL FRACTIONS EQUIVALENTS
A 058 WOODSHOP SAFETY
A 044 BOARD FEET
A 019 MEASURULE
A 009 MEASURULE INFORMATION
A 020 MEASURULE INSTRUCTION 1
A 007 MEASURULE INSTRUCTION 2
A 012 MEASURULE TEST
A 038 RADIAL-LINE DEVELOPMENT
A 022 IED MATH
A 005 CENTERING PROGRAM-UTILITY
A 041 CENTERING-INSTRUCTIONAL PROGRA
A 020 WOOD SCREW
A 012 ENGINE DISPLACEMENT EXERCIZE
A 046 INTRO TO BRIDGE RECTIFIERS
A 028 INDUSTRIAL ARTS INTRO

DISK 003

A 004 HELLO
A 025 OHM'S LAW PROGRAM
A 060 ARC WELDING
A 058 THE CHESSBOARD I
A 054 THE CHESSBOARD II
A 013 WORD SEARCH PUZZLE
A 017 WRENCH PROGRAM
A 011 PROJECT FILE
A 010 PROJECT FILE 2
A 015 TOOL BOX
A 014 TOY TRUCK
A 012 FUNNEL1
A 051 CAMERA LESSON
T 002 TOOL
T 002 FILE2
T 002 TOY
T 002 FUNNEL
A 044 POWER CROSSWORD PUZZLE
A 004 JACK
A 004 T SQ & BOARD
A 003 HAND SAW
A 004 BACKSAW
A 003 RIVETER
A 004 FILE
A 005 T-BEVEL
A 003 HACKSAW
A 006 ARC WELDER STINGER
A 005 COMPASS
A 002 TRI SQUARE
A 006 BRIDGE RECTIFIER
A 006 C-CLAMP
A 038 WOOD JOINERY
A 005 GEAR PULLER

PUBLISHERS' ADDRESSES

Goodheart-Wilcox Co., Inc.
123 West Taft Drive
South Holland, IL 60473

McKnight Publishing Co.
Bloomington, IL 61701

American Technical Publishers, Inc.
12235 S. Laramic Avenue
Alsip, IL 60658

American Vocational Association
AVA Special Publications
2020 N. 14th Street
Arlington, VA 22201

Allyn & Bacon, Inc.
470 Atlantic Avenue
Boston, MA 02210

Marion County ESD
3400 Portland Road, NE
Salem, OR 97303

Davis Publications, Inc.
Technology Education Program
Printers Building
Worcester, MA 01608

Oregon Department of Education
700 Pringle Parkway
Salem, OR 97310-0290

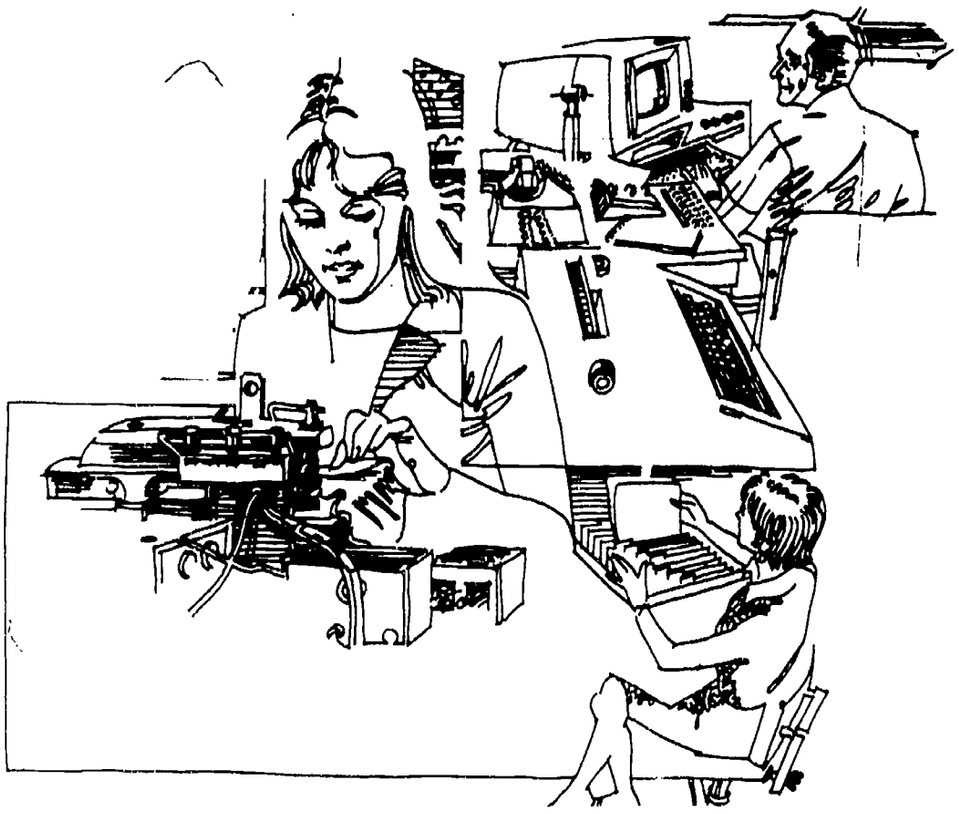
JOURNALS

School Shop
Prakken Publications
416 Longshore Drive
P. O. Box 8623
Ann Arbor, MI 48107

Industrial Education
Hartcourt Brace Jovanovich Publications
Subscription Department
1 East First Street
Duluth, MN 55802

VOCED
Journal of American Vocational Association
2020 N. 14th Street
Arlington, VA 22201

Man, Society and Technology
Journal of the American Industrial Arts Association
1201 16th Street NW
Washington, D. C. 20036



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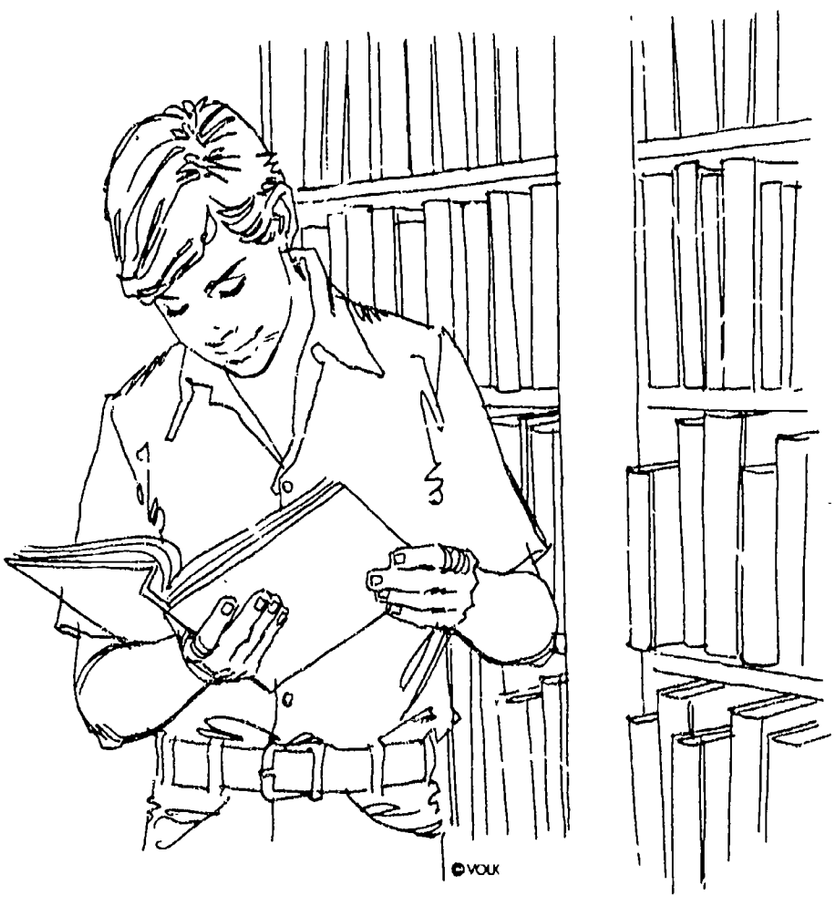
State Department of Education, Master Plan for Industrial Arts in the State of New Mexico (Albuquerque, New Mexico, 1980)

U. S. Department of Health, Education and Welfare Guidelines for Industrial Arts in Career Education (Washington, D. C., 1972)



Middle School Industrial Arts

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